

1.

The carefully prepared proposal for a video communications system has a lot of merit. It also reveals that the author has done a lot of research and analysis of what constitutes such a system.

The idea of a video communications system between Headquarters and the field stations was studied by members of the Office of Training some years ago but, after much research and discussions with possible users, the conclusion was reluctantly reached that such a system had too many drawbacks at the time. Today, those same disadvantages still exist. However, we do feel that eventually such a system will have a place in CIA activities. By the time the individual units are ready for it, we should be able to transmit video signals via an Agency communications satellite and thus the inherent disadvantages of shipping physical tapes will have been obviated.

The major obstacle to direct video communications at the present time is a compound one involving the lack of power in the satellite transmitters, a shortage of bandwidth space for the broad video signal required, and the necessity for huge and expensive antenna arrays for the ground receiving stations.

The basic idea of utilizing video tapes for communications is good. When the subject was broached several years ago by OTR personnel the general feeling was that, even with video tape, such communications would become a complex task. There would be the necessity of establishing a standard video tape recorder; procuring the equipment at considerable initial expense since each station would require a television camera, at least one video tape recorder, and at least one TV monitor plus a supply of tape; getting the relatively delicate equipment safely to each station, and ensuring that a responsible person would maintain and operate the equipment.

Our survey on the subject included many of the OTR instructors, persons selected at random simply because it was known that they had recently returned from overseas posts, and quite a few discussions with Logistics Officers who had served at various stations and were familiar with the utilization of equipment in the field. The Logistics Officers' opinions were considered valuable since they were usually in on proposals to use equipment, had practical knowledge of whether equipment was actually used or allowed to become dust-catchers, and the possibilities of utilization at the stations.

This was an informal survey conducted to see if OTR should or would use closed-circuit television for training reports, pictures of field training, construction of training facilities, and visual reporting of local conditions. The consensus was that the theoretical use would be somewhat less than great, the actual use minimal.

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Our findings are that 99% of people prefer a document or picture they can hold in their hand or lay on their desk to study rather than viewing a similar image on a TV screen. This preference also applies to motion picture or projected still picture images. People have varying attention and information-absorbing spans but this is individually compensated for when using hand-held documents, maps, photos, etc. It also requires no additional equipment that could present logistical, budgetary, or convenience problems.

If an all-visual system were to be utilized, we would favor the more stable and higher-quality film image over a video tape image.

Motion picture film has the advantage of being of a standard format. Any 16mm film can be projected on any American, British, Dutch, French, Italian, German, Japanese, Russian, or other projector. Opposing this is the fact that video tapes are not interchangeable: a tape made on a Japanese video tape recorder will not play on an American, Dutch, or even another Japanese machine.

Film can not be spoiled by radar, magnetic fields, etc. If necessary, film can be duplicated in nearly all major cities. Individual pictures of good quality can be extracted, usually with simple and readily-available equipment. Even three-dimensional pictures can be made. On the other hand, it is difficult (usually impossible) to get a quality still picture from a TV screen even under laboratory conditions. Probably the nearest to a good still picture from a TV source is the Ampex VideoFile system but the investment for this huge and complicated equipment system begins at around \$200,000.

At the present time, very few CIA stations have facilities for playing video tapes. The equipment problem revolves around each communications link having a television camera, a proper microphone, a video tape recorder, and a TV monitor for playing back the video tapes when received. No one unit could be bought and automatically shipped to each station: units would have to be procured that had the electrical characteristics to match those of the station where the equipment would be used. Some stations would have to buy new or greater capacity electrical generators.

The variation in electrical characteristics is wide. Headquarters would use equipment for 117 volts AC, 60 cycle, 1 phase. Another station might require 220 VAC, 50 cycles, 1 phase. Yet another station would require 220 VAC, 25 cycles. Other stations could require other electrical ratings. These are just some of the variables still annoying persons going to various CIA stations: there are other electrical problems as well. For example, television works on a system that clamps on and synchronizes with the cycles (60, 50, etc. per second). Voltage and phase are also important although we will drop "phase" since it will vary the least of the three factors, again assuming that all stations will have a source of AC rather than DC power.

Here in the USA, the world-wide acknowledged leader in stable and interconnected electrical generating systems, there usually is no problem with power.

3.

In fact, there is probably not a reader of this memorandum that can remember when "cycles" were off frequency. Most of us have seen dimming and brightening lights for brief periods as voltage changed but even that is rare today. Electrical fluctuation can cause a TV image to tear to the point it is useless to attempt to get a legible signal. Generally, this would be from a change in voltage which causes a change in the speed of the motor of the tape transport. Should a change in cycles occur, there would be an automatic loss of picture. Here in the Headquarters area we are fortunate in having stable power.

Using Viet Nam as an example, we can see that the voltage and cyclical fluctuation would make video tape operation almost impossible unless the users were at the main base with its huge and fairly reliable electrical generator. Generally, our research shows that cyclical and voltage fluctuations are the rule, not the exception. One man cited personal experiences that included a station where the generator produced an unreliable 220 volts, 50 cycles. At another station the power lines brought in electricity that caused lights to dim and flicker of unmeasured characteristics, and at another post the installed power lines brought in power that was supposed to be 240 volts at 50 cycles. In each instance the power supply was unreliable: flickering could mean a variance in the cycles or the power going off for short bursts while the dimming was probably the varying voltage level. If the light dimmed enough for a person to notice it, a video tape recorder would not be able to playback a signal. In fact, the first dimming would probably cause a severe snarling of the tape as the tape-transport motor slowed. The variation in the light or flickering was probably caused by the uneven cyclical rate of the AC power and, as such, would never permit the video recorder (which synchronizes with cycles) to achieve a recognizable picture. Should such a signal be obtained, it could not last very long.

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Such examples apply only to places where the power supply is unreliable. While we are concerned with Viet Nam, [REDACTED] similar places, we are also involved in areas where we can figure that the electrical characteristics would permit adequate operation of video tape equipment. Obviously, the use of video tape means that a dependable source of electric power must be available and the power would probably have to fit the machine rather than the machine fit the power.

Sending a video tape instead of a training film to an overseas station would have a disadvantage in addition to the factors involving availability of equipment, lack of compatibility or interchangeability of tapes on the various machines, chance of damage to the tape's magnetic signal, etc. This would be the manpower and equipment involved in using special equipment to transfer the 24 frames-per-second film image to the 30 frames-per-second television image. When the price of motion picture prints that come to you ready-to-use are compared with the price of getting a print; transferring the picture to video tape plus all the incidental expenses such as the additional manpower, cost of the tape (\$60.00 per hour approx.), another container for the tape (film comes with container, tape containers may cost \$3.00 or more); and the other factors are considered--well, the video tape copy of a training film could cost as much as the motion picture print.

The inherent difficulty with transferring any motion picture to video is the loss in quality of image, the loss of detail. Even the best adjusted broadcast studio TV equipment does not reproduce the fine tonal quality or detail found in a film. Speaking conservatively, if you were to project a film on a screen so that the image were stretched to eight feet high, there would be more detail in one foot (1/8th) of the 16mm film's projected image than there would be if the entire frame or image were shown on a TV screen one foot in height. In the intelligence business resolution of detail is obviously important. For practical purposes, the highest resolution TV image is just not in a class with the poorest film and never will be (here we are comparing black and white images but a comparison would be even more noticeable with color). Never will be? The TV image will never provide the detail of film because the film image is a continuous image with no detail lost (for practical purposes, that is--a high-powered microscope could find the slight loss of image in film). By comparison, a look at any TV image--including the special "high resolution" type--will immediately reveal to the naked eye that the TV image is composed of lines of dots. There is space between the dots and that space is where the information-bearing image is not being reproduced. More space is between the lines and much more image is lost there--again, the image is not being reproduced. Much more space is between the lines and more image is lost there--so much so that the TV screen, on the average, does not reveal half the detail potentially available for the screen. Remember, the space between the dots and lines represents unreproduced image.

The point might better be brought home by an example. Have you ever seen a movie on TV that you had seen previously in a theatre on a projection screen? In the theatre you could plainly read the note or telegram over the shoulder of the recipient but on your large-screen TV receiver the message couldn't be read. The only messages of this type you could read on TV were when a tight close-up was made. This simple comparison illustrates the difference in resolution or clarity that is so necessary in intelligence matters.

Another disadvantage of video tape would be in sending the tapes between Headquarters and the field stations. All video tapes would reveal, in addition to the basic information, faces and voices of Agency personnel should they ever be intercepted. At first, we might tend to be careful and not include such faces and voices except where necessary but sooner or later more and more would be included as the "personal touch" and thus human nature would cause the security problem to become more acute.

All video tapes are actually magnetic tapes and thus susceptible to damage from magnetic and radio frequency fields from such equipment as radar, radios, X-ray equipment, electric motors, etc. Tapes carried in airplanes are particularly exposed since they are in such close proximity to powerful radar and radio sets, especially if stored in the baggage compartments.

High-powered X-ray machines used to search luggage have large transformers generating powerful magnetic fields with a possible consequent destructive effect on tape. While film can also be damaged in basically the same ways that video tape can, it has the advantage of not being disturbed by the electrical fields that could ruin magnetic tape.

A recent issue of The New York Times (27 Apr 69) revealed that luggage and packages are automatically bombarded with X-rays when passengers and luggage arrive or depart via air at Taiwan. No warning is given via signs or announcements, it was claimed. Such electrical bombardment would not affect motion picture prints or documents but could cause the complete or partial loss of messages on video or audio tapes. It is also felt by many persons that other terminals engage in X-raying packages and luggage on a routine basis.

This is not to say that such a problem could not be licked. It could and would be whenever we determined a policy for handling such magnetically-sensitive materials. However, we must keep this obvious fact in mind: the same magnetic tapes have been used for audio signals for over twenty years and there is still no policy (of which we are aware) within the Agency for handling audio tapes to prevent the loss of the electronic message. For years, OTR has provided steel cans as magnetic shielding for audio tapes but it is still the exception when a traveler bothers to protect valuable tapes with such cans.

On a theoretical basis, the financial savings to the Agency could be considerable if we were to adopt the use of video tapes and abandon all other media. However, you can't fold up a video tape recorder and monitor and carry it in your pocket or envelope as you could a map, plan of operation, or listing of personnel. If we were to adopt closed-circuit television as an additional or supplemental means of communications, then the investment would be substantial although not great when compared with our existing investment in communications equipment. However, tapes could not replace the immediacy of our worldwide radio network since the broadcasts are almost instantaneous while the tapes would have to be shipped.

The investment per station need not be great. A simple system could be obtained for as little as \$4000 which would include the video tape recorder, a TV camera, a monitor with a large screen, and the necessary connecting cables. The actual investment would depend upon the type of equipment chosen as standard.

At the present time, comparatively little closed-circuit television equipment is available. To our knowledge the Agency has the following video tape recorders on hand (could be others), none of which is compatible with any of the others:

- 2 inch wide tape used, quadraplex heads, broadcast type, Ampex Corp.
- 2" tape used, helical scan head, industrial type, mfgd. by Sony Corp.
- 1" tape used, helical scan, industrial type, Panasonic Co.
- 1" tape used, helical scan, industrial type, Ampex Corp.
- 1/2" tape used, helical scan, industrial type, Sony Corp.

Since a tape made on any of the above machines can only be used with any of the other machines by running one (sometimes two) cables from one machine to the other and making a new tape, it can be seen that standards would have to be established before a video communications system could be established.

Even manufacturers do not standardize within their own organization's products. Ampex Corporation makes three types of video tape recorders, no unit being interchangeable with the other. A tape made on any one can not be played on the other two. The same applies to Sony Corporation machines with its non-interchangeable tape widths of 2", 1", and 1/2". The Matsushita recorders (also sold under the names Panasonic and Concord) have two units that are non-compatible since one uses 1" wide tape, the other using 1/2" tape. Phillips (Norelco in USA) has several non-compatible sizes as does Shabaden. The Craig 1" tape machine matches no other nor does the 1/4" tape width Rheem unit.

The IVC (International Video Corp.) unit is sold under their own name as well as the names Bell & Howell, GPL, RCA, and perhaps some others by now.

What this means is that when we go to video tape recorders we will have to obtain replacements for most of those presently owned or we will never have a system, either in the Headquarters area or Agency-wide. Without a system, no one can ever be sure there will be a capability for playing back tapes previously made. As our machines wear out and replacement machines are incapable of playing the old tapes, there may be no way of utilizing such previously recorded material. Thus it is important that a standard be reached if there is to be a communications system based upon video tape.

Will we be able to play back in the future the tapes we have made today? Japan has forced its domestic manufacturers to standardize on one size of tape and head format that makes all machines able to play back tapes from other machines from other manufacturers. Of course, these machines are not being exported. Even if they were exported, these standards would not apply to such units as Ampex, Craig, IVC, Phillips, and others. The indications are that more types are being manufactured rather than any reduction taking place in the present hodge-podge of machines. Any real intercompany compatible seems too far away to consider at this time.

Closed-circuit television is being used within the Office of Training for various purposes. Briefings, analysis of presentations, and self-analysis are some of the uses. Many Briefing Officers and Instructors feel that material presented on video tape, no matter how current it may be, still does not permit the question-and-answer period that usually accompanies their presentations. Other persons feel that certain materials should be captured on tape for use as reference material at some time in the future. Other presentations are preserved on tape because it is relatively easy to make the tape and have it available for playback should the speaker not be available when needed again.

Probably the nearest approach to the uses visualized by the suggestor's plan would be the activities of OTR's Covert Training unit. As of this writing (verified 28 Aug 69) they are not using television. Members of the unit have discussed the subject with OTR's television personnel but feel TV has no significant value at this time. Some research has been done on utilizing the small

self-contained 18-pound camera and recorder package for picturing training exercises so that the tapes could be played back for analysis and criticism. However, the feeling is that the inconvenience and limitations outweigh the possible advantages. Study of the subject continues, though. Also, personnel of Covert Training feel that video tapes from them to other stations would have no practical value in view of the specialized types of tutorial training which are structured for an individual's needs under specific conditions.

The ace-in-the-hole that would make television communications feasible between Headquarters and field stations would be the use of communications satellites. We doubt that the Agency presently has sufficient bandwidth available from the satellite transmitters for such purposes but, if it were available, there could be a certain time each day that ground stations would point their antennas, turn on their video tape recorders and receivers, and pick up and store the messages. With such a use the make of video tape recorder would not matter since the signal would be broadcast via a RF signal from the transmitter. Of course, classified information would require some sophisticated encoding but, with the right type of computer encoding the signal, a special attachment on the TV receiver could re-sequence the signal into readable form.

SUMMARY:

Video tape is a fine method of exchanging information but, under the present conditions seems impractical for world-wide use. Factors entering into this opinion include:

1. Lack of compatible/interchangeable tape equipment; no policy yet.
2. Limited equipment now in use is not compatible, even at Hq.
3. Huge investment required to obtain, ship, and install equipment.
4. Advantages of film over video tape.
5. Advantages of present system utilizing documents, still photographs, maps, etc., supplemented by motion pictures and video tape where feasible for specific applications.

The Office of Training employs all mediums (documents, still pictures, motion pictures, closed-circuit television and tape, etc.), suiting the medium to the desired result or end product. Our experience and knowledge of various mediums convince us that the best approach to an information exchange system for world-wide use at this time would be in the following preferred order of use:

1. Continuing the present system using printed documents, still photographs, etc., supplemented by motion pictures and video tape as the specific situation dictates.
2. Using motion pictures.
3. Using closed-circuit television.